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IS 13956 (1994): Testing transformers [ETD 16: Transformers]



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“Knowledge is such a treasure which cannot be stolen”

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IS 13956 : 1994

भारतीय मानक

(Reaffirmed 2004)

परीक्षण ट्रांसफार्मर — विशिष्ट

Indian Standard

TESTING TRANSFORMERS — SPECIFICATION

UDC 621.314.21 : 620.1

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Transformers Sectional Committee had been approved by the Electrotechnical Division Council.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TESTING TRANSFORMERS — SPECIFICATION

1 SCOPE

This standard covers the requirements for testing transformers which are generally single phase and ONAN cooled.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
335 : 1993	New insulating oils (<i>fourth revision</i>)
1885	Electrotechnical vocabulary:
(Part 38) : 1977	Part 38 Transformers (<i>first revision</i>)
2026	Power transformers : Part 1
(Part 1) : 1977	General (<i>first revision</i>)
2026	Power transformers : Part 3
(Part 3) : 1981	Insulation level and dielectric tests (<i>second revision</i>)
2026	Power transformers : Part 4
(Part 4) : 1977	Terminal marking tappings and connections (<i>first revision</i>)
2071	Methods of high voltage
(Part 1) : 1993	testing : Part 1 General definitions and test requirements (<i>second revision</i>)

3 TECHNOLOGY

For the purpose of this standard, the definitions given in IS 1885 (Part 38) : 1977 shall apply.

4 RATING

4.1 In order to limit the numerous possibilities for manufacturing testing transformers, the following standard values are given. They shall preferably be complied with unless otherwise required in the relevant Indian Standard.

4.1.1 Rated voltage, rated currents and rated power shall be as given in Table 1.

4.2 Duration of operation shall be 15 minutes, 60 minutes or continuous operation.

NOTE — As a rule, designs for 15 minutes operation are sufficient for routine tests. If the tests follow each other rapidly, a design for 60 minutes operation, may be necessary. In the case of heating tests and tests for dielectric stability for instance, a design for continuous operation is necessary.

Table 1 Rated Voltage, Current and kVA
(Clause 4.1.1)

Rated Voltage kV	Rated Current, A						
	0.1	0.2	0.3	0.5	1	2	3
	RATED kVA						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
50	5	10	15	25	50	100	250
100	10	20	30	50	100	200	500
150		30	45	75	150		
200		40	60	100	200		
300		60	90	150	300		
400				200	400		
500				250	500		
600				300	600		
800				400	800		
1 000				500	1 000		
1 200				600	1 200		

4.3 Maximum Impedance Voltages

The related impedance voltage for testing transformers or groups of testing transformers, for example, those connected in cascade shall, at rated frequency and rated current, not exceed the following values:

Up to and including 500 kVA	10 percent
Over 500 kV up to 800 kV	15 percent
Over 800 kV up to 1 000 kV	25 percent
Over 1 000 kV	30 percent

When selecting the impedance, voltage of the entire transformer circuit, allowance shall be made as per IS 2071 (Part 1) : 1993.

5 TOLERANCES

Tolerances on electrical performance shall be in accordance with 11 of IS 2026 (Part 1) : 1977.

6 INFORMATION REQUIRED WITH ENQUIRY AND ORDER

The technical information that the purchaser is required to supply with the enquiry and order is given in Annex A.

7 FITTINGS

Fittings, as listed in Annex B, shall be provided.

8 MARKING

8.1 Rating Plate

8.1.1 Each transformer shall be provided with a rating plate of weatherproof material, fitted in a visible position, showing the appropriate

items given in 8.2. The entries on the rating plate shall be indelibly marked (for example, by etching, engraving or stamping).

8.1.2 The following information shall be given in all cases:

- a) Number of this standard;
 - b) Manufacturer's name;
 - c) Manufacturer's serial number;
 - d) Year of manufacture;
 - e) Number of phases;
 - f) Rated kVA for continuous, 15 minutes, 60 minutes rating (for multi-winding transformers, the rated kVA of each winding shall be given. The loading combinations shall also be indicated unless the rated power of one of the windings is the sum of the rated powers of the other windings);
 - g) Mass of core and winding;
 - h) Rated frequency;
 - j) Rated voltage;
 - k) Rated currents;
 - m) Connection symbol;
 - n) Percent impedance voltage at rated current (measured value corrected to 75°C) and if necessary, the reference power. The reference power should always be given for multi-winding transformers.
- NOTE — If the transformer has several methods of cooling outputs that differ from the rated power may be shown as percentage of the rated power, for example, ONAN/ONAF 70/100 percent.
- p) Type of cooling;
 - q) Total mass; and
 - r) Mass and volume of insulating oil.

8.1.3 When the cascade/testing transformer is required with a built-in compensation reactor to facilitate testing of capacitive loads, the following information shall be given:

- a) Reference to this standard;
- b) Manufacturer's name, SI No. and year of manufacture;
- c) No. of phases;
- d) Rated frequency;
- e) Rated voltage, current, kvar;
- f) Rated inductance; and
- g) Service duty.

8.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

8.2.1 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark

may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

9 CONNECTION DIAGRAM

Each transformer shall be provided with a connection diagram in accordance with 2 of IS 2026 (Part 4) : 1977.

10 TESTS

10.1 Type Tests

All tests given in 10.2 and 10.3, in addition to the following, shall constitute type tests:

- a) Output voltage tests,
- b) Temperature-rise test, and
- c) Short-circuit test.

10.2 Routine Tests

The following shall constitute routine tests:

- a) Measurement of winding resistance;
- b) Ratio, polarity and phase-relationships;
- c) Impedance voltage;
- d) Load losses;
- e) No-load-losses and no-load current;
- f) Insulation resistance;
- g) Induced over voltage withstand at 1.2 times rated voltage for 60 seconds;
- h) Separate source voltage withstand and on low voltage winding corresponding to its rated voltage;
- j) Calibration test [IS 2071 (Part 1) : 1993]; and
- k) Flash over test.

10.3 Special Tests

The following tests shall be carried out by mutual agreement between the purchaser and the supplier:

- a) Wave form distortion test, and
- b) Partial discharge test.

NOTES

1 Temperature-rise test is applicable only to those transformers which are continuously rated. In case of short time rated transformer, the temperature-rise test to be conducted at equivalent continuous loading condition based on agreement between the suppliers and the purchasers. As in testing transformers, the no-load-losses can be more than the load-losses, the method of conducting the temperature-rise test is subject to agreement between the manufacturer and the customer.

2 If insulating oils are used in the transformer, it shall conform to IS 335 : 1993.

3 Whenever compensating reactors are provided, these shall meet the requirements of relevant Parts of IS 5553 series.

10.4 Method of Test

Unless otherwise specified, the tests shall be carried out in accordance with relevant clauses of IS 2026 (Part 1) : 1977 and IS 2026 (Part 3) : 1981.

ANNEX A

(Clause 6)

INFORMATION REQUIRED WITH ENQUIRY AND ORDER

- | | |
|---|---|
| a) Rated supply voltage; | e) Whether the unit ordered is in cascade with existing unit, |
| b) Rated continuous and short time secondary voltage, | f) Whether input regulator and control panel required, and |
| c) Rated continuous and short time power, | g) Fitting list. |
| d) Whether cascading required in future, | |

ANNEX B

(Clause 7)

B-1 FITTINGS

B-1.1 Fittings as listed below shall be provided:

- a) Rated plate,
- b) Terminal marking plate,
- c) Two earthing terminals,
- d) Lifting lugs,
- e) Drain-valve with plug or cover plate,
- f) Oil filling hold with cover,
- g) Air release device,

- h) Jacking lugs,
- j) Filter valve, and
- k) Rollers.

B-1.2 The additional fittings as given below may be provided, if ordered:

- a) Inspection cover,
- b) Dehydrating breather,
- c) Oil level indicator with minimum,
- d) Conservater, and
- e) Gas and oil actuated relay.

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